

June, 1969

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G 800 CONSTRUCTION

The duties and responsibilities of the engineer during the construction of City projects require skills beyond the technical knowledge of design. The engineer's relationship with the public, the contractor, the inspector, and representatives of other agencies involves skills in public relations as well as knowledge of construction methods, City standards of construction, traffic requirements, etc. This chapter summarizes the design engineer's role during this important period.

G 801 CONTROL

City control of construction involves many City Bureaus, each having specific duties and responsibilities within the scope of the contract. The Bureau of Contract Administration inspects construction materials and workmanship and enforces compliance with the plans, specifications, and terms of the contract. The Bureau of Standards samples and tests all materials incorporated into the work. In the Bureau of Engineering, many Divisions are involved. The Survey Division provides the surveys required for construction (for City contracts only). The Utility and Estimating Division notifies the owners of public utilities of needed relocations of their facilities. The Coordinating Division negotiates supplementary agreements, processes change orders, negotiates extra work costs, etc. The Design Division or District makes necessary design changes and decides on the intent of the plans and specifications. The engineer's duties are those of the Design Division or District which he represents.

There are other City Bureaus indirectly involved in the construction of storm drain projects.

G 810 RESPONSIBILITIES AND RELATIONSHIPS

In meeting his responsibilities during construction, the engineer must conduct himself in a manner that is a credit to himself and the City. As an engineer, he must always strive to provide public facilities of the highest standard at the lowest cost.

To facilitate his work during construction, the most important asset to the engineer is cooperation with the contractor, inspector, and other agencies. The engineer must continuously endeavor

They primarily advise the engineer on matters pertaining to their specialty. They are the Bureau of Assessment, the Bureau of Sanitation, the Bureau of Street Maintenance, and the Bureau of Right of Way and Land. The Bureau of Street Lighting and the Department of Traffic make the necessary design changes for their own facilities affected by the contract.

G 802 CONTRACT DOCUMENTS

The instruments which specify the type, amount, location, method, and time of construction are the contract documents. These documents are listed in Section 2-5.2 of the Standard Specifications for Public Works Construction, with supplements. They are intended to be complementary and to describe and provide for a complete improvement.

The documents to which the engineer most often refers in his work during construction are the project special provisions, the plans, and the standard specifications.

Project special provisions give the special or unusual requirements specifically applicable to the project. The project plans, including all standard plans and shop or supplemental drawings and specifications referred to thereon, are the drawings approved by the City Engineer which delineate the work to be constructed. The Standard Specifications govern the performance of a contract, set standards, and control the materials used and the workmanship or performance required for work ordinarily involved in construction. The engineer must not deviate from the plans and specifications except to meet emergencies in construction.

to develop and maintain this cooperation without compromising City standards or undermining his authority.

G 811 CONTRACTOR-INSPECTOR-ENGINEER

The Board of Public Works has the final authority in all contract matters; it awards the contract, approves major changes, and makes the final acceptance of the construction work.

The contractor is responsible for the construction of the project in accordance with the terms and documents of the contract, including work which he subcontracts and materials and products which he is required to furnish

The inspector, who represents the Board of Public Works, is responsible for enforcing compliance by the contractor with the terms of the contract; with the plans and specifications for the project; and with the laws and regulations of the City, State, and Federal governments. He must apply his knowledge of the plans and specifications to determine the acceptability of construction methods and techniques. He determines standards of workmanship, finished appearance of the work, and adequacy of clean-up. He arranges for the final inspection and notifies all parties concerned.

The engineer is responsible for design and changes in design. He interprets the plans and specifications to determine the intent of the design when a conflict arises. He determines that the completed work meets the intent of the plans and specifications.

For construction projects under permits, the private design engineer has primary responsibility for design, changes in design, and preparation of change orders and sketches during construction. He must submit said change orders and sketches to the District/Division Engineer having jurisdiction for approval prior to incorporation of the change in the work. The private engineer may consult with the District or Division Engineer, but the private engineer shall prepare the change order. The private engineer may also attend the joint final inspection.

In their relations with each other, the contractor, the inspector, and the engineer should not encroach on the others' responsibilities. The contractor must not deviate from the plans and specifications without prior approval from the engineer. The inspector must not make field design changes. The engineer should not stop work without consulting the inspector or unnecessarily restrict the contractor's methods of construction. Whenever a problem arises, all parties involved should be informed, so that each party may par

ticipate in the solution according to his responsibility.

When resolving a problem, the engineer must be thorough in his investigation, practical in his solution, and firm in his decision to the contractor. Evidence of intimate knowledge of the plans and specifications and a willingness to be fair in decisions will go a long way in promoting respect for the engineer's judgment.

The closest cooperation shall be maintained at all times with the inspector and other City Bureaus or Departments, as well as with the Federal, State, and County agencies. Any complaints or difficulties encountered in the field with other agencies shall be brought to the attention of the District or Division engineer.

G 812 PUBLIC RELATIONS

In meeting the public, the engineer is expected to be pleasant and courteous at all times. It is important that the engineer be helpful and considerate in answering the public's questions. If he cannot answer the questions, he should refer them to the proper authority for accurate information. Should a property owner present a construction problem to the engineer concerning his property, the engineer should discuss the problem with the inspector and the contractor and arrive at a mutually agreeable solution. Above all, the engineer should generate a feeling on the part of the property owner that the City is not an impersonal organization, but that it is responsive to his problems and requests.

It is the policy of the Board of Public Works to furnish information to the general public on matters pertaining to the Department of Public Works. However, the information which the engineer may furnish is necessarily limited to the scope of his functions. The engineer is cautioned therefore to answer only routine inquiries and to be absolutely sure of the accuracy of his information. Such information as that pertaining to policies, procedures, official action of the Department, and cost estimates of future contracts shall be referred to the Division or District Engineer. The engineer is especially cautioned against releasing any information which might involve claims or lawsuits to which the City may become a party. (See Subsection G 012.5.)

G 820 NOTICE TO BIDDERS AND ADDENDUM

It is a well recognized rule that all prospective bidders are entitled to whatever information the City has which will influence the cost of the job. Sometimes the necessity for a change in plans and specifications is known well in advance of the time bids are received. Therefore, during the period after a job has been advertised and before bids are received, the proper way to convey information that is not on the plans or specifications is to issue a Notice to Bidders or Addendum.

By relying on change orders and stipulated prices to convey that information, the City is frequently placed in a disadvantageous bargaining position. If the contractor can show that the con-

tract and stipulated prices do not apply, the City may be forced into negotiation. Also, change orders are intended to take care of changed conditions that appear after bids are received.

A Notice to Bidders is a document reserved primarily for instances when the plans or specifications need clarification rather than changing. An Addendum is a formal supplement to the specifications approved by the Board of Public Works. The design engineer, through the Division/ District Engineer, shall initiate the issuance of a Notice to Bidders or Addendum through the Utility and Estimating Division.

G 830 DUTIES DURING CONSTRUCTION

During construction, the engineer is the project technical adviser and should visit the construction site. Often when construction is stopped due to an unforeseen technical problem, the engineer must resolve the problem as quickly as possible so that work may be resumed. The engineer's decision not only must be in accordance with the intent of the plans and specifications, but it also must be equitable to the City and the contractor.

The engineer's duties during construction are summarized as follows:

1. To make design changes and prepare change orders necessary to correct changed conditions. (Section G 831).
2. To approve or disapprove alternate materials or methods of construction when requested by the contractor (Section G 832).
3. To interpret the plans and specifications when they are found to be in conflict. (Section G 833).
4. To keep the Division or District engineer posted on the progress of the project (Section G 834).
5. To observe construction techniques to improve future designs.

(Also see Sections 2 and 3 of the Standard Specifications.)

G 831 CHANGE OF DESIGN

Whenever field conditions (on projects subject to City inspection) are such that construction cannot be performed according to the plans and

specifications, a change is required. The City Engineer or his representative is the only person authorized to make such a change. Design changes during construction are issued as change orders in accordance with Section G R40 herein.

It is general policy of the city to restrict changes to those actually required to complete the work as contemplated at the time the plans and specifications were approved. No work beyond the scope of the project should be authorized by the engineer. Only such changes as those necessary to correct unanticipated conditions which affect construction or corrections required to insure the proper functioning of the facility are acceptable alterations. The engineer should not depend on change orders to make changes in design known prior to construction. Such changes should be made when determined rather than during construction.

In resolving a design change, the engineer should be aware of the contractor's problems as well as the terms of the contract. A short discussion with the contractor and the inspector should reveal to the engineer all aspects of the difficulty. Also a review of contract and stipulated prices should resolve whether or not the cost of the change must be negotiated with the contractor. Any unusual aspects of a proposed change should be brought to the attention of the Change Order Section of the Coordinating Division to insure consistency in this Bureau's approach to the solution of the problem. Change orders should be

written in terms of end result whenever possible so as not to restrict the contractor's method of construction.

G 832 APPROVAL OF ALTERNATE MATERIALS

For convenience, certain materials or products may be designated on the plans or in the specifications by a manufacturer's name or trade name with the phrase or equivalent added. This phrase allows, subject to the approval of the engineer, the use of alternatives of equal quality which have the required characteristics of the material or product named.

Before the engineer approves or disapproves an alternate material or product, he must satisfy himself that the alternative is of comparable quality and suitability to the original. This may be done by reviewing the manufacturer's specifications, comparing the product to the City's standard specifications, or by visual inspection. The contractor may be required to furnish information or tests at his own expense. The engineer may request the help of the Bureau of Standards. All materials or products shall be new and unused except when otherwise specifically authorized by the plans or specifications.

The engineer shall diligently pursue his investigation to approve or disapprove a product in order to prevent delaying work if possible. However, it is the contractor's responsibility to request approval far enough in advance of construction to allow for a proper investigation.

G 833 INTERPRETATION OF PLANS

As the project technical adviser, the engineer makes all interpretations of the plans and the specifications. In the event of a discrepancy between the plans and the specifications or in regard

to questions of their intent, the engineer's decision will be final. In dealing with such problems, the engineer must consider the contractor's viewpoint as well as the City's in order to render a fair and just decision. Decisions based upon bare existence of a doubt or upon the use of technicalities should be avoided. The rule of reason and prudence must be applied.

In case of a conflict between two contract documents, the document higher in precedence shall control. The order of precedence of contract documents is given in Section 2-5.2 of the Standard Specifications for Public Works Construction, with supplements.

G 834 CONSTRUCTION PROGRESS

The engineer shall visit the site of construction periodically to observe the progress made and check that all work is in accord with the project requirements. He should keep his superiors fully informed of all important facets of the work.

The District/Division Engineer (or responsible members of his staff) of each design office that is affected shall keep apprised of the project's construction progress by referring to the Daily Assignment Sheet of the Bureau of Contract Administration, making periodic visits to each project, and maintaining close contact with the inspector(s) assigned to the project. He shall immediately advise the Bureau of Contract Administration when any deviations from the plans or specifications are discovered by notifying the inspector on the job in writing, or by leaving word for the inspector to call the engineer. A written notation of each job visit will be made on the Project Visit Report ([Figure G 834](#)), stating general job conditions observed, or special conditions if the visit was for a specific reason.

G 840 CHANGE ORDERS

After a contract is awarded or a Class "B" construction permit is issued, any changes in the contract require a change order. A change order, as the name implies, is an order to the contractor to do something other than that required by the plans, specifications, or other contract documents. A sample change order and sketches are illustrated in [Figures G 840](#) and [G 840A](#).

In writing change orders, the engineer should give complete instructions for the proposed construction and should direct these instructions to the contractor. The change order should not be phrased in language which implies the contractor has to change City plans. Nor should the phrasing imply that the work has already been done. Vague and indefinite statements such as *as constructed*,

the plans should be changed, etc., should be avoided. The change order must be complete, since it must be used to make as built corrections on the plans.

The engineer should not attempt to put into words what can more readily and understandably be shown on a simple sketch to accompany the change order. When a change order refers to a sketch, Paragraph 2 of the change order should read construct (item) in accordance with Change Order Sketch No.

G 841 PROCEDURE

As soon as it has been determined that a change order is required for projects under City contract, the originating design office must promptly notify all parties involved of the impending change.

For Capital Improvement or Assessment Act projects, the originating office shall call the Change Order Section of the Coordinating Division to secure a serial number and contract number (if applicable). The design office should coordinate such requests to prevent the assignment of different serial numbers to the same change order. For "B" Permit projects, a sequential number system shall be initiated and kept by the originating office.

All copies of change orders prepared by the design office (except the original copy sent to Coordinating Division) shall have the stamp PRELIMINARY CHANGE ONLY on it when distributed prior to the formal City Engineer approval (see Section G 843).

The distribution of preliminary change orders by the originating design office for projects under City contract is as follows:

1. Coordinating Division-Original and 1 copy
2. Originating Office-Retain 1 copy
3. Contractor-1 copy
4. Contract Administration-2 copies
5. Survey Division-1 copy (when survey is required)
6. utility and Estimating Division-2 copies (if utilities are affected)
7. Grade Sheet Section of Utility and Estimating Division-1 copy (when required by Central District Design Offices only)

Once initiated, a change order shall be prepared, submitted, and processed by the City as soon as possible. The processing includes negotiating price with the contractor (if required), redistributing copies (when required), and obtaining all necessary approvals. A project cannot be accepted or progress payments made to the contractor until all change orders to date are completed and issued.

G 842 PREPARATION CHECK POINTS

The change order shall include four items shown as separately numbered paragraphs, but subparagraphs may be used if multiple items are to be included. These items are as follows:

1. Reason for the change
2. Description of the change
3. Change in contract cost
4. Change in contract time

Check points for the proper preparation of a change order are listed below.

Title Block: Give the exact job title and plan reference. The job number is the project Work Order number (W.O.), the Assessment Act number (A'11), or the "B" Permit number. The Contract Number is a number issued for all contracts. It is also used on change orders for certain W.O. projects. The Serial Number is the change order sequential number for the project (see Section G 841). The Order Number is a City document number filled in by the Administration Division when the change order is issued.

Item 1: Make a brief, clear, and definite statement of the reason for the change. Do not duplicate this statement in Item 2 below.

Item 2: Make a clear and complete statement of the description of the change. It should be easily understood and should not lend itself to misinterpretation. Stations and dimensions must be complete enough to check quantities in Item 3 below. If a sketch is required, state *Construct* *in accordance with Change Order Sketch Serial No.* The sketch serial number is the same as the change order serial number. Do not state attached, as copies of the change order distributed do not all require sketches.

The sketch title must contain the exact job title, work order (or "B" Permit) number, change

order serial number, the plan reference, and the number of sheets if more than one sketch is used. Change order sketches shall be drawn on the standard forms (see [Section G 840](#)) whenever possible. Vellum or profile paper may be used for a change order sketch only when it is impractical to use the standard form.

Item 3: For each item noted in Item 2 above, show the change in contract cost in the following order: quantity (rounded off to bid units), unit, item description, unit price, type of price (in parentheses), and extension. The type of price shall be contract price, stipulated prices or extra work price. Do not consolidate unit prices or bid items. The Change Order Section of the Coordinating Division shall negotiate any changes in contract cost prior to the work being done where unit prices are not included in the contract or in the schedule of extra work prices. Extensions of additions and deductions should be kept in separate columns to facilitate checking. When there is more than one item, summarize to show total net addition or total net deduction.

Do not extend prices for pavement or base to be paid by tonnage; show only an asterisk (*) in the extension column. The following note is then shown just below Item 4:

Final payment will be made under the respective bid item based on actual tonnage laid.

Item 4: When the change order work does not affect the contract time, the design engineer shall complete Item 4 as follows:

No change in contract time.

If the contract time is affected, the design engineer shall leave Item 4 blank. The Change Order Section of Coordinating Division will determine the extension of time to complete the work required by the change order.

G 843 APPROVALS

Within the limitations given in [Section G 844](#), the Division or District Engineer can issue preliminary change orders without further authorization. Such preliminary change orders (see [Section G 841](#)) are subject to the approvals listed at the bottom of the change order form and are thereby

subject to change. Change orders which cannot be issued without first acquiring the above approvals are listed in [Section G 844](#).

For Capital Improvement projects, a change order over \$2000 requires approval by the Board of Public Works. A Board Report shall then be prepared by the originating office and shall be forwarded with the change order to the Coordinating Division for processing. The following note shall appear near the bottom of such change orders:

Approved by the Board of Public Works on (date).

For 1911 Assessment Act projects, the Streets and Highways Code provides that changes exceeding certain limitations require a modification of the proceedings. Whenever these limitations are exceeded, the following note shall be placed at the bottom of the change order and all subsequent change orders:

The contractor in approving this Change Order hereby agrees to the modification procedures as required by the Streets and Highways Code. Approved by (contractor's name) on (date).

For 1941 Assessment projects, changes beyond the limitation of the Municipal Code require City Council approval.

If negotiation is required and extra work prices are used, the change order must contain the following note:

Approved by (contractor's Firm Name) on (date).

Signed

When a change order reflects a deviation from normal design criteria or standard practices, or requires a Board Report, the change order, its accompanying sketch (if any), and the Board Report must be approved by the Chief Engineer of Design. Routine construction changes do not require this approval.

The District or Division Engineer signs all change orders and sketches, and initials required Board Reports before forwarding them to the Coordinating Division for processing. The remaining

signatures shall be obtained by the change order section of Coordinating Division. For most change orders, the District or Division Engineer's approval is sufficient to allow the distribution of preliminary copies of the change order. However, when further authorization is required, such as change orders in amounts beyond specified limitations, or changes reflecting a deviation from normal design criteria or standard practices, the distribution of copies shall be withheld until such authorization is obtained from the Coordinating Division or the Chief Engineer of Design.

On change orders of more than one sheet, signatures shall be made only on the last sheet. The notation Page of Pages shall be inserted above the signature block-at the bottom of all sheets. Leaving sufficient space for the Contractor's signature, all approval notation shall be placed directly above the page notation or above the signature block for one-sheet change orders. Initials of the person writing the change order, along with the typist's initials, shall be shown in the lower left-hand corner above the signature block. For change orders of more than one sheet, these initials need only be shown on the last sheet.

G 844 FINANCIAL LIMITATIONS

There are limits to the dollar amount for which a change order can be issued. These limits vary with the project financing.

For Capital Improvement (or Cash Contract) projects, a change order in excess of \$2000 requires the approval of the Board of Public Works. The Board may approve changes in work up to 25% of the original total contract amount, which includes all change orders issued. Additional work which is clearly outside the scope of the original contract and which is not exempted by Section 386 of the City Charter is limited to \$5000.

For Assessment Act projects under the 1911 Act, the State Streets and Highways Code specifies the following limitations:

1. For a contract not exceeding \$100,000, the change order is limited to \$1000.
2. For a contract in excess of \$100,000, the change order is limited to 1% of the contract amount, not to exceed \$4,500.

Such limitations do not apply if a change is requested by a property owner who will be assessed for the work

Changes exceeding these amounts must be made through the modification procedures (Chapter 8.5 of the Code), which require a resolution of modification, public hearings, and other procedures. The total amount of all changes, through either change orders or the modification procedures, cannot exceed 20% of the original contract amount.

For Assessment projects under the 1941 Ordinance of the Municipal Code, the total cost of the project that can be assessed to property owners, including the cost for change orders, cannot exceed 10% of whichever is lower, the engineer's cost estimate or the bid price. For change orders in excess of the above 10%, other funds must be provided by the City Council.

For limitations on "B" Permits and Emergency Change Orders, see Sections G 845 and [G 846](#).

G 845 "B" PERMITS

A project built under a "B" Permit is privately owned construction, which, if found to meet City criteria and standards, will be accepted by the City as a public facility upon completion. Although the City checks "B" Permit plans, the private engineer, representing the owner, is responsible for design, changes in design, and preparation of change orders and sketches during construction. During construction, the City provides the processing of change orders in cooperation with the private engineer.

Change orders for "B" Permit projects may be initiated by a City design engineer or the private engineer, but must be approved by both parties. Usually, the private engineer submits change orders to the City design office of jurisdiction for review prior to approval. The City design office must also check if the estimated cost of the additional work is covered by the existing bond. "B" Permit change orders are prepared in the same manner previously described except for the following differences:

1. The City design office shall originate and insert the sequential change order serial number.

2. If the City is not participating in the cost of the project, Item 3 (Change in Contract Cost) shall state as follows:

This change does (or these changes do) not exceed the 10% limitation of the Municipal Code, Section 62.116.

3. If the City is participating in the financing of the project and the change order involves the City's portion, Item 3 shall be completed in the same manner as for a cash contract ([Section G 842](#)), and the following note shall be inserted above the signature block:

The City's share of this cost addition (or reduction) is % of \$ (cost of change, Item 3) or \$ in accordance with City Contract No. between the permittee and the City.

4. There shall be no Item 4 on any "B" Permit change order unless the City participates in the cost of the project.

The distribution of "B" Permit change orders is as follows:

1. Coordinating Division-Original and one copy
2. City Division or District-Retain one copy
3. Contract Administration-two copies
4. Contractor-one copy
5. Private Engineer-three copies

All copies of the change order (except the original copy sent to Coordinating Division) shall have the stamp PRELIMINARY CHANGE ONLY on

G 850 FINAL INSPECTION

Upon completion of his work, the contractor calls the Bureau of Contract Administration for a final inspection. For City contracts, the Bureau of Contract Administration coordinates the final inspection and notifies all parties involved. The inspection party, consisting of the contractor, the final inspector, the design engineer, and at times representatives from other agencies, reviews the work in the field and if all concur that the work is satisfactory, the City accepts the work. The contractor is then paid, the bonds are released, and the contract is fulfilled.

The Bureaus of Contract Administration and Engineering are to make a joint final inspection.

it when distributed prior to the City Engineer's approval.

G 846 EMERGENCY CHANGE AUTHORIZATION

Should a change in construction be required and it is not practical to delay construction of that portion affected by the change until such time as a regular change order can be issued, an Emergency Change Authorization will be issued in writing in the field.

Authority to issue an emergency change authorization is limited to personnel at the level of Civil Engineer or higher and such other individuals designated in writing by the Division or District Engineer to the Coordinating Division. The estimated increase or decrease in cost of work ordered by an Emergency Change Authorization is limited to a maximum of \$1000. It is imperative that the Change Order Section of the Coordinating Division negotiate any changes in contract cost of work not covered in bid items prior to the work being done. Also, the forms shall be completely signed by all parties (as indicated on [Figure G 846](#)) before starting the work specified therein.

Emergency Change Authorizations should be issued only when requested by the contractor or at the discretion of the City Engineer for emergency situations delaying construction. They shall be confirmed by a regular Change Order as soon as possible.

If the engineer considers it expedient, he may make a separate final inspection. In either case, at an appointed time during final inspection, the engineer, the inspector, and the contractor will meet on the project site to prepare the Final Inspection Correction List as follows

A. The final inspector will telephone the responsible engineer(s) at least 24 hours in advance of final inspection. (Where the date of final inspection is relatively flexible, the final inspector will check with the engineer in order to arrive at a mutually satisfactory time and date.)

B. For uncomplicated projects requiring only a short period of time for final inspection, the engi-